Annex A – Case Study – Recent UK Flooding and Implications for Openreach

Overview

In our answers to Question 3 of this response we reviewed the recent evidence concerning extreme weather experienced in the UK over recent years. We also set out the research from the UK Met Office and other academic bodies that such extremes are expected to increase both in magnitude and frequency, and therefore that Ofcom should take full account of the challenges Openreach will face from extreme weather over the next control period.

As we identified in our previous FAMR submission, 2012/13 and 2013/14 now look to form a part of a longer trend in UK weather patterns[1], one which is in line with expectations for the types of greater weather extremes likely to be driven by climate change.

The extremes of weather cause extreme fault intakes raising overall levels of faults experienced by Openreach. They damage communications infrastructure and also severely impacting Openreach's operational capability to respond. The initial impact is caused by a variety of different weather variables including rain, wind, fog, lightning and other factors, but the major secondary impacts resulting from rising ground water levels, flooding, coastal erosion and tidal surges are also highly damaging. In this Annex we review the impact of flooding on Openreach performance and consider data from the Environment Agency and the Adaptation Sub-Committee (ASC)[2]. This data sets the scene for expectations over the next control period and beyond.

Environment Agency (EA) and the Adaptation Sub-Committee (ASC) Flood Plain Analysis

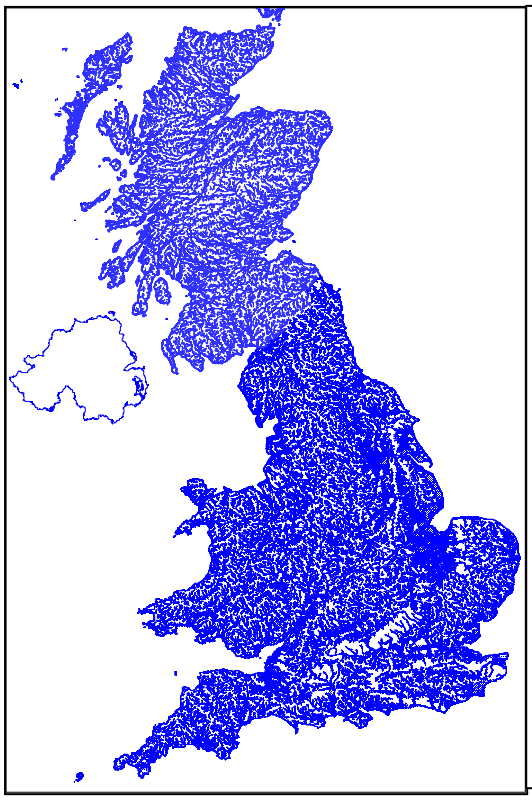
The EA produces detailed flood risk data for the whole of the UK. The standard level of probability used by majority of planning agencies is the 1% data set and the agency produces an interactive Flood Map which can be used to assess risk at a local level. The Flood Map is designed to increase awareness among the public, local authorities and other organisations of the likelihood of flooding, and to encourage people living and working in areas prone to flooding to find out more and take appropriate action. The Flood Map is also used by those people who wish to apply for planning permission in England to see whether the site they plan to develop is in a flood risk area.
The probability or likelihood of flooding is described as the chance that a location will flood in any one year. The likelihood is expressed as a percentage (e.g. 1%) or as a chance expressed for example

[1] See analysis carried out on our behalf by the Walker Institute, University of Reading and others :

http://stakeholders.ofcom.org.uk/consultations/fixed-access-market-reviews/?showResponses=true&pageNum=2#responses

[2] Part of the UK Committee on Climate Change

as a 1 in 100 chance in any given year. This data is illustrated below for the whole of the UK showing the extensive nature of such risks throughout the region.



Environment Agency
Flood Plain Data

- Areas coloured blue show land area subject to a 1% flood risk (ie 1 in 100 years).
- Total land area at risk covers some 24.7k square km (10.7% of total area)
- Openreach has substantial infrastructure in these areas
  - 7178 (7.8%) cabinets located in area
  - 9198 T-codes (8.1%) located in area
  - 1,569,247 lines (6.0%) located in area
  - 502,272 jointing chambers (8.4%) located in area

Land use planning is a key determinant of Openreach vulnerability to flooding events and the potential impacts of climate change, as decisions on the location and design of new developments have implications for many years in the future and may be practically irreversible.

The ASC identified land use planning as priority issue for analysis in their 2011 report[3]. Their main analysis focussed on actual development decisions and planning policies across a sample of local authorities[4], focussing primarily on eleven local authorities within five broad localities (north London, Tees Valley, Humberside, South Hampshire coast and the Severn Valley) representative of a range of climate risks facing communities.

- Hull[5] and East Riding have the highest number of properties at risk from flooding of all local authorities in England[6] and one of the most rapidly eroding coastlines.
- Hull, Tewskesbury, Gloucester and South Gloucestershire were all significantly affected by the 2007 flooding and the centre of Stockton-on-Tees faces significant flood risk.
- Densely urban London boroughs like Islington and, to a lesser degree, Haringey were disproportionately affected by the 2003 heatwave and are likely to be at a high risk of surface water flooding.
- South Hampshire's coast faces a combination of river, coastal and surface water flood risk, high rates of coastal erosion and in some areas risk from heat stress.

[3] http://www.theccc.org.uk/publication/adapting-to-climate-change-in-the-uk-measuring-progress-2nd-progress-report-2011/

[4] Research by Arup (2011) - commissioned by the Adaptation Sub-Committee to provide an overview of the land use planning system in relation to adaptation to climate change.

[5] The Hull area is note served by Openreach but by KCOM Group plc.

[6] Environment Agency (2009)

Trends in development within these localities will be broadly representative of the types of decisions being made in other areas facing similar risks.

The findings

In their study of land use change over the last ten years in eleven local authorities, they found that:

- Development in areas of flood risk increased in eight of the nine local authorities at risk from river and coastal flooding and in four of them the rate of development was higher than across the locality as a whole.
- Three of the four coastal authorities saw an increase in development in areas of eroding coastline, and in two of them, the rate of development on unprotected coastline was higher than across the authority as a whole.
- The area of hard surfacing increased in five of the six urban authorities studied, primarily at the expense of urban greenspace, which declined in all six authorities. This is likely to exacerbate surface water flooding and the urban heat island effect.
- Development applications sampled included variable levels of adaptation at the property level, from nearly all applications (96%) in areas of river and coastal flood risk, to 55% of applications in areas of surface water flooding risk. In one London borough 70% of applications included measures to reduce water stress and 28% of applications had measures to deal with heat stress.

Impact on Openreach Assets

This indicates that land use planning decisions are increasing the vulnerability of some areas to climate impacts. These are also important considerations for Openreach as due to the nature of telecommunications infrastructure and particularly the Openreach access network, it is vulnerable to a wide range of weather variables (e.g. rainfall, high winds, lightning etc). The direct effect of weather damage may be the need to replace or repair assets, and this can be extensive and costly, but highly significant in the context of this market review it is the consequential generation of customer fault reports and failures of service to end-users that is perhaps the most relevant issue.

The effects of weather are also highly geographically diverse, adding another layer of complexity and volatility to forecasting and consequential resourcing. Faults can occur simultaneously across all regions or can be massively different in scale, type (e.g. lightning faults in Cornwall, flooding in London etc.).

Openreach infrastructure is extensive, and all major assets classes (ducting, poles, copper, fibre and street cabinets) are predominantly externally located (approximately two-thirds of the access infrastructure is underground) and covers the whole of the UK[7] in all rural and metropolitan areas.

As Openreach serves the vast majority of the UK's residential and business customers and delivers the infrastructure element of the UK telephony Universal Service Obligation (USO) its assets are located in both high and low risk flood areas. Openreach has substantial levels of assets already located within these flood risk zones but current planning processes are now leading to ever higher absolute levels of assets being exposed to flood risk. This is in addition to the greater incidence and magnitude of the extreme weather and flooding forecast to occur in the future.

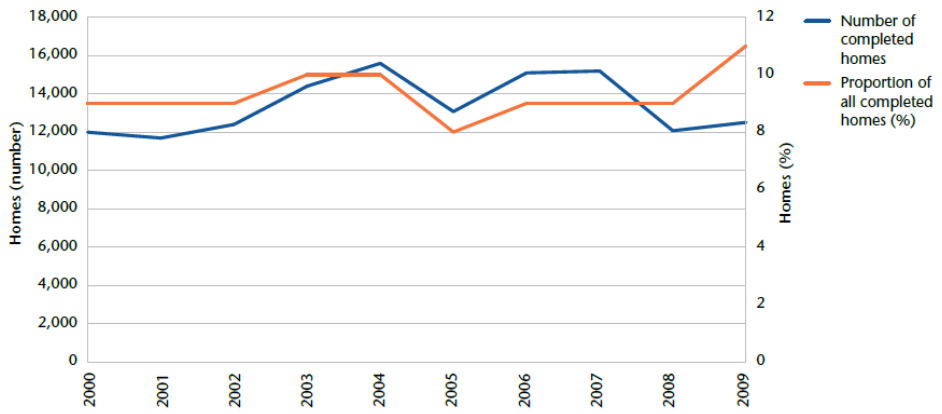
[7] Excluding Hull area.

Current Trends in Planning

Local authorities face difficult trade-offs when planning the future of their localities, as the costs to the local economy of constraining development in areas at risk from climate impacts can be significant. In a small minority of authorities there are few, if any, alternative sites available for development. Although the ASC found some evidence of long-term, strategic planning for adaptation, it was unclear how influential these initiatives were on local development plan policies and actual development decisions.

The ASC found that the rate of new development in areas of high flood risk has remained fairly constant over the last 10 years, and hence the cumulative impact of these new developments has potentially increased vulnerability to flood risk. In the last decade, between 12,000–16,000 new homes have been built every year in areas of high flood risk. This has remained a fairly constant proportion (around 10%) of all new residential development (Figure 3.2). This compares with a stock of approximately 1.3 million homes currently located in areas of high flood risk (equivalent to 4.5% of the total housing stock). Much of the new development will have been on previously developed ('brownfield') land already located in the flood risk areas.

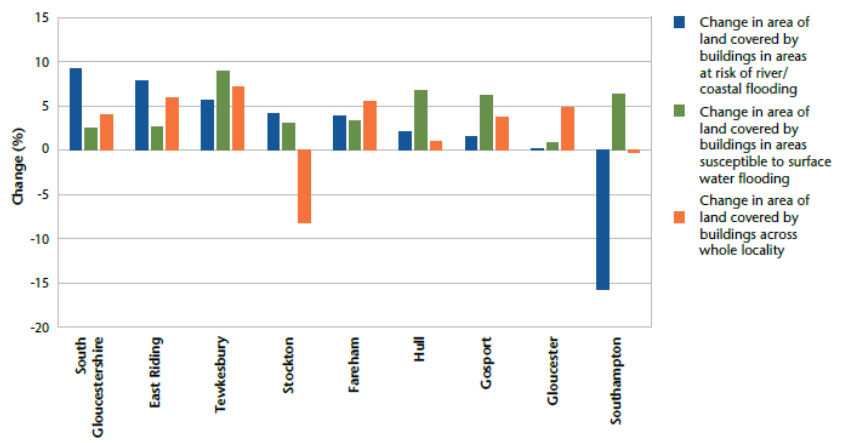
Figure 3.2: Number of new homes and % of all new homes built within areas of high flood risk in England (2000-2009)



Source: Department for Communities and Local Government Land Use Change Statistics (2010b).
Note: High flood risk areas defined as Flood Risk Zone 3, which does not account for flood defences. Figures on percentage of new dwellings located in flood risk zone 3 from DCLG Land Use Change Statisitics. Figures on number of dwellings calculated by applying the annual proportion of new dwellings in high flood risk areas to the total number of completed dwellings obtained from DCLG Housing & Planning Statisitics (2010a).

In the more detailed studies carried out the ASC found that eight of the nine local authorities studied have seen an increase in the amount of buildings within areas of river/coastal flood risk in the last ten years. In four authorities the rate of development has been higher in river/coastal flood risk areas than across the locality as a whole. Development in areas at risk from surface water flooding has also been higher in five of the authorities (Figure 3.3).

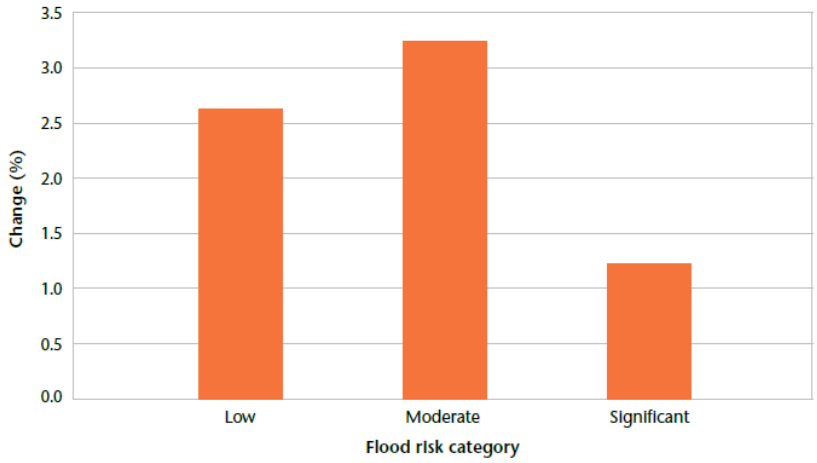
Figure 3.3: Change in area covered by buildings within river/coastal flood risk categories and in areas susceptible to surface water flooding, compared with change in area of buildings across the locality as a whole (2001-2011)



Source: Arup (2011) for Adaptation Sub-Committee.
Note: River/coastal flood risk categories are a combination of the three categories used by the Environment Agency's National Flood Risk Assessment (NaFRA): low, moderate and significant. Southampton experienced a slight decrease (0.2%) in buildings across the locality as a whole and a significant decrease (15.7%) within river/coastal flood risk areas. Further investigation of the Mastermap data identified three large development sites within the flood risk areas which were classified as 'Buildings' in 2001, but in 2011 are now classified as 'Unknown'. These are likely to be vacant or half constructed development sites. These three sites alone account for approximately 75% of the total decrease in built-up area. However, as they are likely to still be built-up, in reality there probably has not been any reduction in the amount of developed land within the area of flood risk. The decrease in built-up area across the whole of Stockton (8.2%) is due to a number of derelict industrial sites being reclassified as 'unknown' on Mastermap, probably reflecting de-industrialisation over the last decade. Note we did not assess change within Islington as it has no area of river/ coastal flood risk, or Haringey which has less than 5% of its area at river/coastal flood risk.

Even when accounting for flood defences, residual flood risk has increased across the nine authorities studied over the last ten years. The rate has been higher in areas of moderate risk, where there is between a 1 in 200 and 1 in 75 chance of flooding in any given year (Figure 3.5).

Figure 3.5: Change in area covered by buildings within low, moderate and significant flood risk categories across nine local authorities sampled (2001-2011)



Source: Arup (2011) for Adaptation Sub-Committee.
Note: The flood risk categories are from the Environment Agency's National Flood Risk Assessment. These consider the chances of weather severe enough to cause a flood, and the likelihood this will overwhelm defence structures or lead to their failure. The three flood risk categories are defined as: low (less than 1 in 200 chance of flooding in any given year); moderate (1 in 200 to 1 in 75 chance) and significant (greater than 1 in 75 chance). This figure represents the aggregate percentage change in developed area across the nine authorities surveyed in each of the three flood risk categories. There were some significant variations between authorities. For example, Southampton saw a 21% decrease in land at significant flood risk (reflecting the changes noted in Figure 3.3), whereas East Riding saw a 12% increase.

The direction of change is clear and overall property flood risk is increasing and hence increasing Openreach exposure to flood risk. In fact planners have overridden the advice of the Environment Agency 197 times in the past 10 years, by giving the green light to new housing developments on

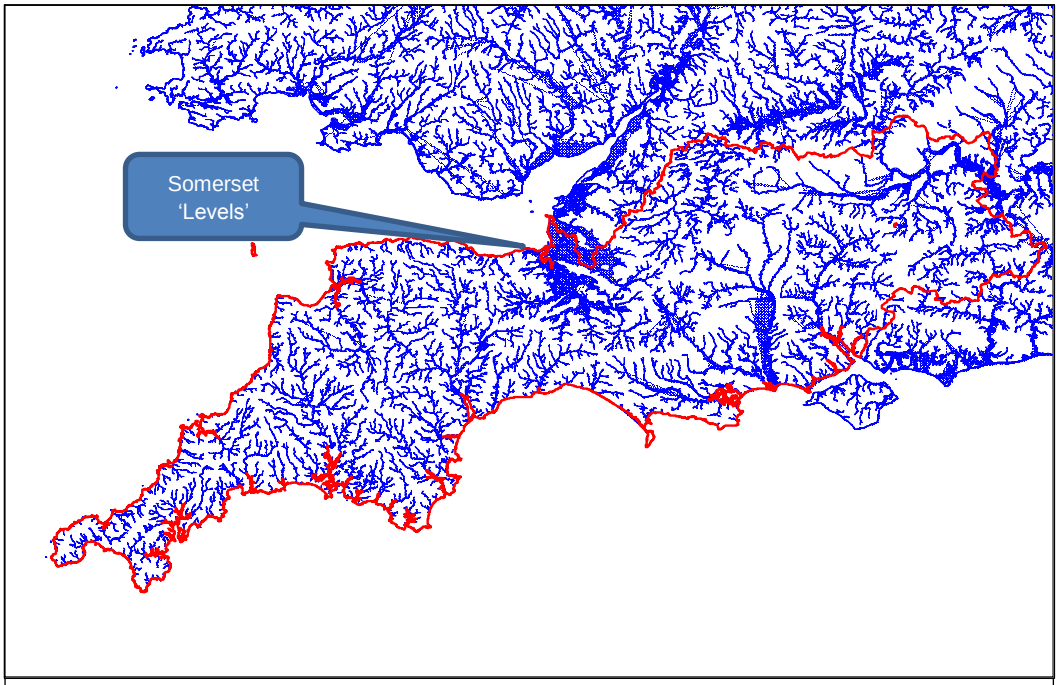
sites at risk of flooding[8]. The findings, based on responses to a freedom of information request by Inside Housing to 220 English local authorities, come despite major floods having occurred every year since 1999 - and in the face of an expected increase in flooding due to climate change. The data, covering 2002 to 2012, also reveals that no one is tracking the full scale of the problem because about half of the sample group of councils could supply only partial data or no data at all.

Further data from the Committee on Climate Change recently broken down for the first time by local authority area shows a wider trend to build homes on floodplains[9] but also shows wide variation between regions. Ninety five per cent of new homes in Eastbourne Council's jurisdiction were built on floodplains between 2001 and 2011, for example, although just 29 per cent of the local authority area is on a floodplain. This contrasts with East Cambridgeshire Council – where about half its area is on a floodplain, but just 2 per cent of new homes were built there. Other notable areas where a high degree of new build (2001-11) was on the flood plain include:

- Maidenhead - 24%
- Elmbridge (Surrey) - 21%
- Sedgemoor (Somerset) - 63%
- North Somerset - 52%

Recent experiences in South West England

As part of this submission we have looked more closely at the factors at play in the Openreach Wessex GM region. The influence of flooding and extreme weather are both obvious in the operational data over recent months, and these factors can be seen to explain the impact on fault intake and Openreach performance. The EA Flood Map data is shown below for the South West region of the UK. The Openreach GM patch for Wessex is shown by the red boundary line.

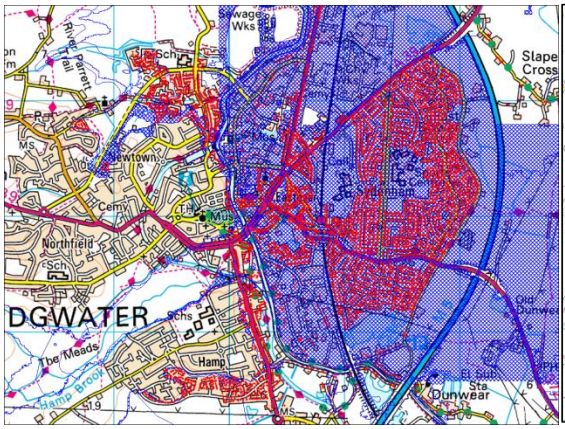


Blue shaded areas show Government 1% flood risk areas for South West England.
The Openreach Wessex patch is shown with red boundary.

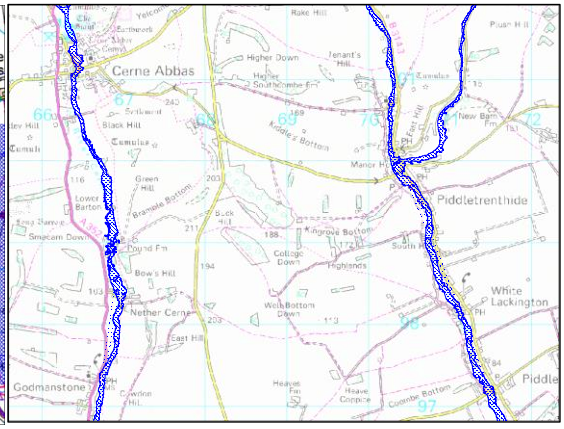
[8] http://www.insidehousing.co.uk/development/homes-built-in-flood-risk-areas-despite-warnings/6525946.article

[9] The figures, which can be found in an interative map at www.insidehousing.co.uk/flood, show a wide discrepancy in how different councils approach flood risk. http://www.insidehousing.co.uk/ihstory.aspx?storycode=6525904

We further analysed the various extremes of flood risk geotype which exist in the region (although these variations can also be found throughout the UK). Broadly they can be classified into two types – (i) a relatively densely built housing area, and (ii) a more dispersed and highly rural build.



Bridgwater



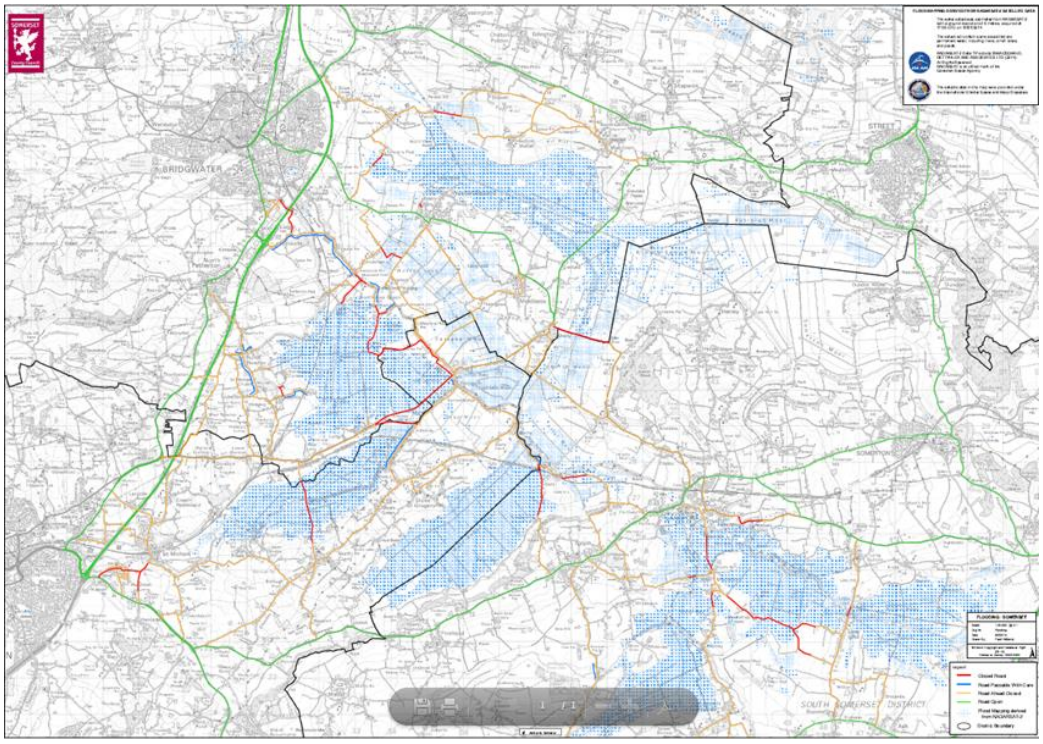
Cerne Abbas and Piddletrenthide

Typically (newer) housing developments might be found grouped more densely and all properties broadly subject to the same risk. These would be in relatively dense urban areas along a river or coast. The example illustrated above is from Bridgewater, Somerset. There are also more isolated rural properties typically along water courses, and the more rural area above is also from the Wessex Region, being Cerne Abbas in Dorset.

Flooding in areas such as these both directly impact on Openreach performance and cause severe repair and provision issues broadly:

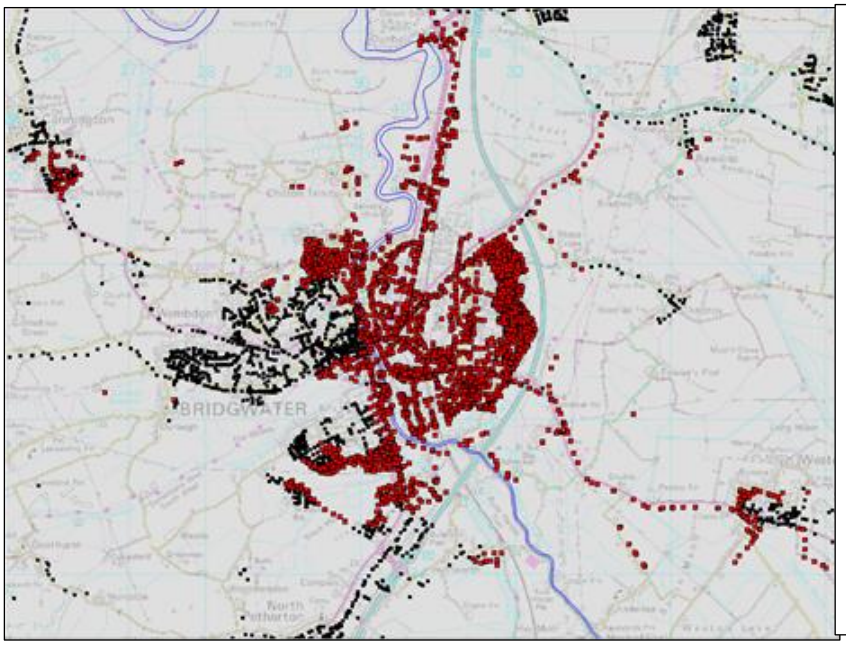
- Urban areas impact predominantly because of volume of lines impacted in single incidents, and hence the high fault intake and the inability to resolve faults for long periods of time. There would typically also be no means of access to the flooded infrastructure.
- But service to isolated rural homes in flooded areas can also be impacted because of engineering difficulties is diagnosing and repairing long lines and from difficulties in reaching the location of the isolated property.

Data from Somerset County Council on road closures in the Somerset Levels region due to flooding illustrates the logistical difficulties for any service organisation.



Flooding not only affects our equipment but also our ability to respond by reaching fault locations or in diagnosing faults and accessing plant. Areas shaded in blue show flooded areas, roads marked in red are closed, roads in blue are passable with care, roads marked with in orange mean road ahead closed. Roads marked in green are open. District boundaries are shown in black.
We have also tested how closely the EA 1% Flood Plain data correlates with the actual observed data shown above, and can confirm a very close match.
http://www.somerset.gov.uk/irj/go/km/docs/CouncilDocuments/SCC/Documents/Environment/Highways/Flooding%20-%20Roads%20affected%20-%20Web.pdf

We further analysed the location of Openreach footway boxes in the Bridgwater area. As would be expected there is a substantial clustering of access points close to the main residential areas – boxes within the flood plain are shown in red. However, it is also significant that many of the remaining boxes are located along local roads which may be subject to road closure and/or traffic restrictions which would significantly impact Openreach's ability to access its infrastructure.

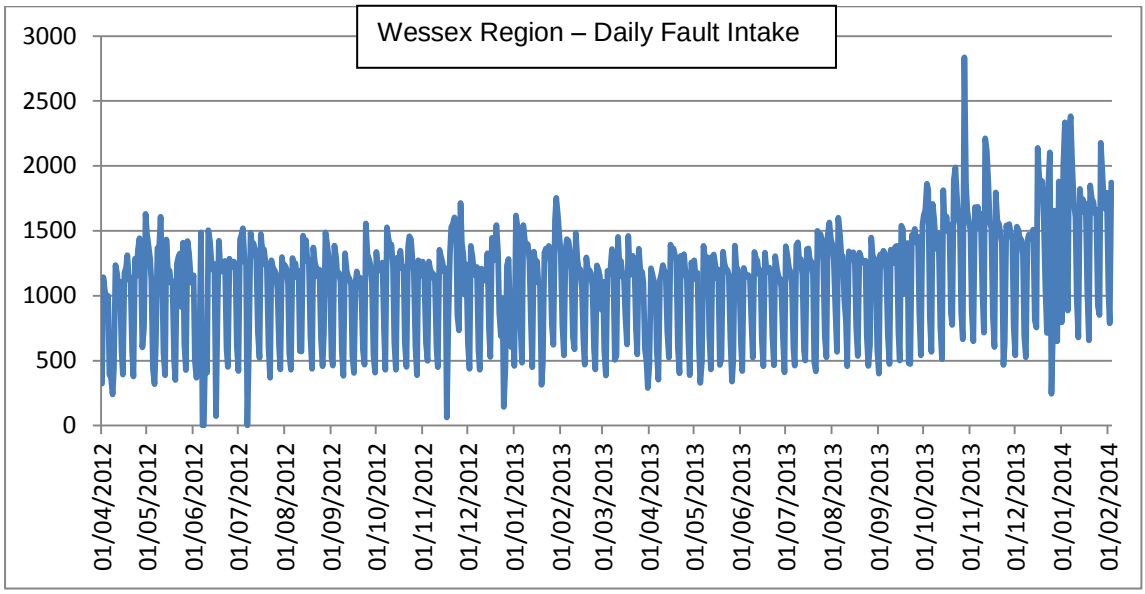


An analysis of Openreach footway boxes located in the Bridgwater area of Somerset.

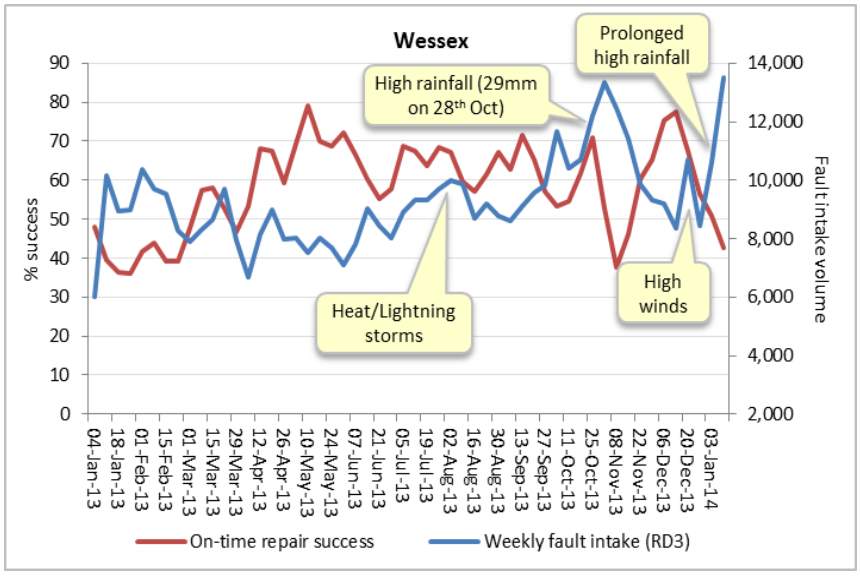
Boxes marked in red are located in the Flood plain. Those marked in black are not, but are typically located along local roads which may be subject to traffic restrictions in times of extreme weather or flooding.

The Impact on performance in the Wessex GM patch

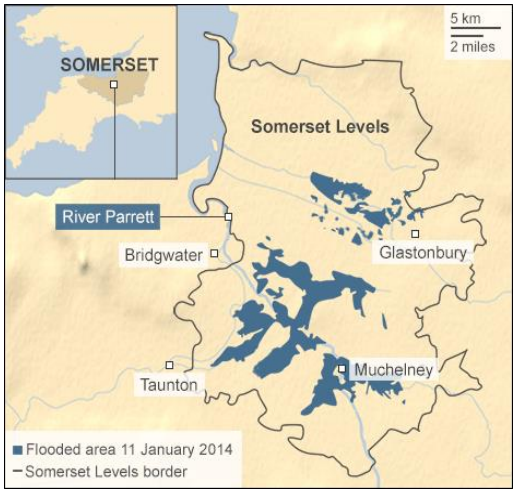
The impact of extreme weather and subsequent flooding in the Wessex region is obvious in the statistics. From early October fault rates intakes began to rise substantially. The maximum intake was 2835 on 28th October 2013. This was immediately followed by large intakes in mid-November, and then the region barely had time to recover from the October and November impacts before extreme bad weather hit again over the Christmas period. A further very high intake of 2383 then occurred on 7 January 2014.



The daily statistics are a good indication of the peak impacts in initial fault intake and are clearly linked to extreme weather. However, increasingly it is not only the immediate impact of these peak events that need to be taken into account, but the backlog effects that are experienced due to secondary flooding, road closures etc as noted above. Wessex is perhaps the best and most recent example of how this weather impacts Openreach fault rates and on how its extent and severity can damage Openreach infrastructure and severely impede our operational ability to respond. The graph below illustrates the impact of the recent weather damage in Wessex GM patch. Not only does overall fault intake increase by circa 40-50% on last year, but a direct impact on service quality can also be clearly noted.



This impact is not a short term effect and will potentially extend the service and fault problems in the area for some time into 2014. The extent of flooding is immense in UK terms, and has left areas of the UK with abnormally high groundwater levels and extensive areas of flooding – most notably in the Somerset Levels:



Some areas of flooding extend for up to 15 or 20 km continuously, damaging Openreach network and impeding its ability to carry out repairs, provisions or even fully assess the extent of the damage. Extensive renovation of network will be required in due course when engineers can access plant.

The effects on end-users, CPs and Openreach cannot be overstated. Openreach's ability to service end-users and access its infrastructure is severely disrupted, and extensive damage is caused to infrastructure both over and underground, causing very high fault intake rates, increases MBORC rates, increased costs, longer travel times and significant health and safety concerns for engineering teams. All directly raising costs for the business.

Conclusion

The Wessex scenario is one example of the broader operational challenge that Openreach will face, and one which Ofcom needs to address sufficiently during the next control period. The reality is that much larger areas of the UK are now at risk of flooding and Openreach assets will be located in those regions and will be damaged. There will also be a corresponding impact on Openreach performance.

The Government's Climate Change Committee (CCC) found in 2012[10] that 13% of new build is now in flood plains – higher even than the 11% found by the Chartered Insurance Institute in 2012. Additionally, the BBC has reported[11] that planning applications on flood plains have been going up every year for the last 5 years surveyed – suggesting that the pattern in the late 1990s was also for an increase in build on flood plain. This is particularly pertinent given the apparent recent acceleration in extreme rainfall trends – ie that in the period since 2000 the UK has seen several of the wettest years on record. In effect, a problem exacerbated by the laxity in planning in the 1990/2000s has come home to roost[12] with the increasingly high rainfall years since 2000.

[10] 1. http://www.independent.co.uk/environment/nature/the-more-the-experts-warn-against-the-more-we-build-on-flood-plains-9101710.html

[11] 1. http://news.bbc.co.uk/1/hi/programmes/panorama/archive/1228625.stm

[12] 1. Attached link illustrates how Environment Agency advice on floodplains has been ignored on 197 occasions by local authorities in the 10 years to 2013.

http://www.insidehousing.co.uk/development/homes-built-in-flood-risk-areas-despite-warnings/6525946.article

In summary, this is a systemic problem growing by virtue of increased build on flood plains, combined with increased intense rainfall. With new build on flood plains at circa 13% as cited by the CCC, this is a growing problem in absolute terms and as an increasing proportion of housing stock as the new build rate is persistently higher than the flood plain percentage for UK as a whole.

Additionally, we have a historic problem of housing stock within floodplains already and Openreach has enduring obligations (as part of BT Group) to serve this legacy housing stock. We are limited to the extent that we can site assets within the network such that our floodplain exposure is reduced (as indicated above current estimates are that circa 8% infrastructure is already at risk). The ability to move such network assets (cabs) etc. further away might either not be possible, result in poorer service (line length of copper) or be material additional investment.